(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 302 430 A1

(12) EUROPEAN PATENT APPLICATION
published in accordance with Art. 158(3) EPC

(43) Date of publication:
16.04.2003 Bulletin 2003/16

(21) Application number: **00929880.3**

(22) Date of filing: **26.05.2000**

(51) Int Cl.[7]: **B66B 7/00**, B66B 11/04

(86) International application number:
PCT/JP00/03408

(87) International publication number:
WO 01/089975 (29.11.2001 Gazette 2001/48)

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE

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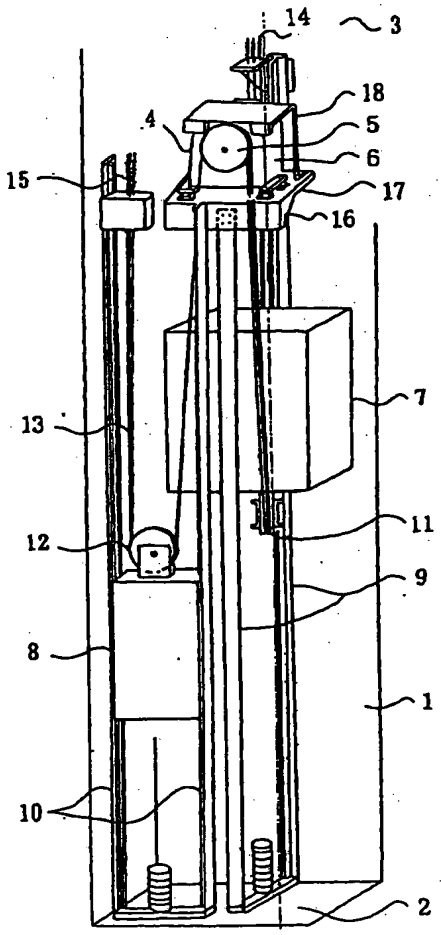
(54) ELEVATOR DEVICE

(57) In an elevator apparatus according to the present invention, a traction machine is disposed at a top portion of a hoist passage for a car within a hoistway. Further, a traction sheave is disposed so as to face a wall of the hoistway, and is located between a gap between the car and the wall of the hoistway when viewed from the top, while a motor portion is disposed so as to overlap the car when viewed from the top thereof. The traction machine is set on a machine base fixed to top portions of car guide rails, and the rolling of the traction machine is prevented with a brace mounted on the machine base. According to this structure, the cross-sectional space of the hoistway can be effectively utilized.

FIG. 1



EP 1 302 430 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to a machine room-less type elevator in which a traction machine is disposed at a top portion of a hoistway.

BACKGROUND ART

[0002] Figs. 6 and 7 show a conventional machine room-less type elevator described in Japanese Patent No. 2593288.

[0003] In the figures, reference numeral 1 denotes a hoistway; 2, a pit portion; and 3, a hoistway top portion. Reference numeral 4 denotes a traction machine, which is disposed at the hoistway top portion 3, and includes a traction sheave 5 and a motor portion 6. Reference numeral 7 denotes a car adapted to ascend/descend in the hoistway, and reference numeral 8 denotes a counterweight adapted to ascend/descend in the hoistway. Reference numeral 9 denotes two car guide rails for guiding the ascent/descent of the car 7, and reference numeral 10 denotes two counterweight guide rails for guiding the ascent/descent of the counterweight 8. Reference numeral 11 denotes two suspension sheaves located under the car 7 and provided in the vicinity of the car guide rails 9. Reference numeral 12 is a suspension sheave provided on the upper portion of the counterweight 8. Reference numeral 13 denotes a wire rope, which is fixed at one end thereof to a car rope retaining portion 14 at the hoistway top portion 3, and extends upward via the two suspension sheaves 11. Furthermore, the wire rope 13, which is wound around the traction sheave 5 of the traction machine 4, drops as far as the suspension sheave 12, and then extends upwards via the suspension sheave 12 until the wire rope 13 is fixed at the other end thereof to a counterweight rope retaining portion 15. The driving force of the traction machine 4 is transmitted by means of this wire rope 13.

[0004] The traction machine 4 is disposed above the car guide rails 10 such that the traction sheave 5 and the motor portion 6 face the car and a wall of the hoistway 1, respectively. Additionally, as shown in Fig. 7, the traction machine 4 is disposed within a space between the wall of the hoistway 1 and a hoist passage for the car 1.

[0005] Next, referring to Fig. 6, the operation of the conventional machine room-less type elevator constructed as described above will be described. When the traction machine 4 is driven, the traction sheave 5 rotates, and the wire rope 13 is moved by virtue of traction. As the wire rope 13 moves, the car 7 and the counterweight 8 move vertically in opposite directions to each other.

[0006] As described above, in the conventional machine room-less type elevator, since the traction machine 4 is disposed between the car 7 and the wall of the hoistway 1 such that the traction sheave 5 faces the car, the following problems are caused.

(1) In cases where the size of the traction machine 4 needs to be increased, as the size of the car 7 increases, the storing space between the car 7 and the wall of the hoistway 1 for the traction machine 4 also needs to be increased, with the result that the cross-sectional area of the hoistway becomes large.

(2) Since the motor portion 6 is located on the wall side, the maintenance and inspection of brakes (not shown) or the like which are disposed on the motor portion 6 side in order to avoid electrical components or oil thrown from the rope becomes difficult.

DISCLOSURE OF THE INVENTION

[0007] The present invention has been made to solve the above-mentioned problems inherent in the conventional machine room-less type elevator, and an object thereof is to reduce the space for the hoistway without being affected by the size of the traction machine. Another object of the present invention is to facilitate the maintenance and inspection of the elevator.

[0008] According to the present invention, there is provided an elevator apparatus having: a car adapted to ascend/descend within a hoistway of the elevator apparatus; car guide rails for guiding the ascent/descent of the car; a counterweight adapted to ascend/descend within the hoistway in a direction opposite that in which the car descends/ascends; counterweight guide rails for guiding the ascent/descent of the counterweight; and a traction machine disposed at a top portion within the hoistway, having a traction sheave around which a rope is wound and adapted to raise/lower the car and the counterweight via the rope by rotating the traction sheave, wherein the traction machine is disposed above a hoist passage for the car and the traction machine partially overlaps the car when viewed from the top thereof.

[0009] Further, the traction machine is disposed so that the traction sheave faces a wall of the hoistway, the traction sheave being located within a gap between the wall of the hoistway and the car.

[0010] Still further, the traction machine includes the traction sheave and a motor portion for rotating the traction sheave, the motor portion being located so as to partially or totally overlap the car when viewed from the top thereof.

[0011] Yet further, the elevator apparatus has a machine base that is fixed to top portions of the car guide rails, wherein the traction machine is fixed onto the machine base.

[0012] Further, the elevator apparatus has a machine base to which the traction machine is fixed and a first supporting member disposed between the machine base and the traction machine for elastically supporting a vertical load of the traction machine.

[0013] Furthermore, there are provided a machine base to which the traction machine is fixed and a brace mounted on the machine base for preventing the rolling of the traction machine.

[0014] Moreover, the elevator apparatus has a second supporting member disposed between the brace and the traction machine for elastically supporting a horizontal load of the traction machine.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015]

Fig. 1 is a perspective view showing the structure of an elevator apparatus according to a first embodiment of the present invention;

Fig. 2 is a plan view showing the elevator apparatus according to the first embodiment;

Fig. 3 is a detail view showing the traction machine fixing portion according to the first embodiment as viewed in a direction designated by an arrow A of Fig. 2;

Fig. 4 is a perspective view showing the structure of an elevator apparatus according to a second embodiment of the present invention;

Fig. 5 a perspective view showing the structure of an elevator apparatus according to a third embodiment of the present invention;

Fig. 6 is a structural view showing a conventional machine room-less type elevator; and

Fig. 7 is a plan view showing the conventional machine room-less type elevator.

BEST MODE FOR CARRYING OUT THE INVENTION

[0016] Embodiments of the present invention will be described below.

(First Embodiment)

[0017] Referring to Figs. 1 to 3, a first embodiment of the present invention will be described.

[0018] Fig. 1 is a perspective view showing a machine room-less type elevator apparatus according to the first embodiment of the present invention, Fig. 2 is a plan view showing the machine room-less type elevator apparatus according to the first embodiment, and Fig. 3 is a detail view showing the traction machine fixing portion according to the first embodiment as viewed in a direction designated by an arrow A of Fig. 2. In those figures, reference numerals like to those used in the description of the conventional example indicate identical or corresponding parts of the conventional example.

[0019] Reference numeral 16 denotes a machine base on which a traction machine 4 is disposed. This machine base 16 is fixed to top portions of car guide rails 9. As shown in Fig. 2, the machine base 16 partially overlaps a car 7 when viewed from the top thereof. This machine base 16 may be constructed so as to be fixed to counterweight guide rails 10, as well. The traction machine 4 is constructed so that a traction sheave 5 is disposed to face a wall of a hoistway 1, while a motor portion 6 is disposed to face the car 7 side of the hoistway 1. Thus, when viewed from the top, the traction sheave 5 is located in a gap between the wall of the hoistway and the car, and the motor portion 6 is located so as to overlap the car.

[0020] Reference numeral 17 denotes vibration isolators provided between the traction machine 4 and the machine base 16 for elastically supporting a vertical load of the traction machine.

[0021] Reference numeral 18 denotes a brace fixed to the machine base 16 for suppressing the rolling of the traction machine when in operation. This brace 18 is made to be integral with the machine base 16 and the car guide rails 9. In the case where the machine base 16 is also fixed to the counterweight guide rails 10, the brace 18 is then made to be integral with the machine base 16, the car guide rails 9 and the counterweight guide rails 10.

[0022] Reference numeral 19 denotes vibration isolators provided between the traction machine 4 and the brace 18 for elastically supporting a horizontal load of the traction machine 4 generated when the traction machine 4 rolls. An elastic body such as rubber is used for these vibration isolators.

[0023] The brace 18 is formed by an L-shaped member and is adapted to surround the back, top and front sides of the motor portion 6 of the traction machine 4. Then, the vibration isolators 19 are disposed between the back side of the motor portion 6 and the brace 18 and between the front side of the motor portion 6 and the brace 18, respectively. Such a structure is suitable for supporting the rolling of the traction machine 4.

[0024] One end of a rope 13 drops from the traction sheave 5 as far as suspension sheaves 11, then extends upwards via the suspension sheaves 11 and is connected to a rope retaining portion 14 at a top portion of the car guide rail 9. The other end of the rope 13 drops from the traction sheave 5 as far as a suspension sheave 12 of the counterweight, then extends upwards via the suspension sheave 12, and is connected to a rope retaining portion 15 at a top portion of the counterweight guide rail 10.

[0025] With such a structure, since the gap required between the car 7 and the wall of the hoistway, need only be one corresponding to at least the thickness of the traction sheave 5, the cross-sectional area of the hoistway when viewed from the top can therefore be reduced. The effect of this structure is related to the traction sheave 5 of the traction machine 4 being disposed so as to face the wall of the hoistway 1, while the traction machine 4 is disposed at a top portion of the hoist passage for the car 7.

[0026] Since the motor portion 6 of the traction machine 4 is disposed so as to face the car 7 side of the

hoistway 1, the maintenance and inspection of the motor 6 and the brake device mounted in the vicinity of the motor portion 6 becomes easier. In particular, this structure is advantageous when maintenance personnel perform maintenance and inspections when standing on top side of the car 7.

[0027] Additionally, since the relationships between the traction machine 4 and the car suspension sheaves 11 and between the traction machine 4 and the car 7 are maintained through the car guide rails 9 functioning as a reference, even if the size of the car 7 changes, the car 7 can always be suspended at a portion in the vicinity of the center of gravity thereof. Furthermore, with this structure, it is difficult for the car 7 to tilt, and therefore good riding comfort can be secured.

[0028] Moreover, in this embodiment, the traction machine 4 is not disposed between the car 7 and the wall of the hoistway, but, as shown in Fig. 2, is inherently disposed so as to partially overlap the car 7. Even when the size of the traction machine 4 needs to be increased as the size of the car 7 increases, there is no need to increase the size of the gap between the car 7 and the wall of the hoistway. In the case of the conventional example, as the cross-sectional area of the car 7 increases with the increase in its size, the gap between the hoist passage of the car 7 and the wall of the hoistway needs to be increased, and this requires in turn an increases in cross-sectional area of the hoistway, resulting in an increase in cross-sectional area of the overall elevator apparatus. In the case of the first embodiment, however, only the cross-sectional area of the car 7 needs to be increased when the size of the car 7 increases.

[0029] Thus, with the embodiment of the present invention the cross-sectional area of the overall elevator apparatus can be designed smaller than with the conventional example.

(Second Embodiment)

[0030] Fig. 4 shows an elevator apparatus according to a second embodiment of the present invention. The machine base 16 for the traction machine 4 is constructed so as to be supported both on car guide rails 9 and counterweight guide rails 10. According to this embodiment, not only can the effectiveness provided by the first embodiment be provided but also the traction machine can be supported more securely, whereby a stable elevator apparatus can be provided.

(Third Embodiment)

[0031] Fig. 5 shows an elevator apparatus according to a third embodiment of the present invention. Reference numeral 20 denotes fixing hardware, that fixes part of machine base 16 partially to the walls of the hoistway. This allows bending loads applied to the car guide rails 9 to be transformed into buckling loads, thereby making it possible to reduce the size of the guide rails 9.

[0032] In the above embodiments, the traction sheave 5 is disposed so that its rotating side becomes parallel to the wall surface of the hoistway which the rotating side confronts, but the traction sheave 5 may be disposed so that its rotating side becomes inclined relative to the wall surface of the hoistway.

[0033] In the above embodiments, the counterweight 8 and the traction machine 4 are disposed close to the same wall of the hoistway, but they may be disposed close to separate walls of the hoistway.

[0034] A gearless or geared traction machine may be adopted as the hoist machine 4 described in the above embodiments. In the above embodiments, while the traction machine 4 is described as including the traction sheave 5 and the motor portion 6, a brake device or the like provided in the vicinity of the motor portion 6 for braking the rotation of the traction sheave 5, may also be included in the traction machine 4.

[0035] Thus, as described above, according to the present invention, there is provided an elevator apparatus having: a car adapted to ascend/descend within the hoistway of the elevator apparatus; car guide rails for guiding the ascent/descent of the car; a counterweight adapted to ascend/descend within the hoistway in a direction opposite that in which the car descends and/or ascends; counterweight guide rails for guiding the ascent/descent of the counterweight; and a traction machine disposed at the top portion within the hoistway, having the traction sheave around which the rope is wound and adapted to raise/lower the car and the counterweight via the rope by rotating the traction sheave, wherein the traction machine is disposed above the hoist passage for the car and the traction machine partially overlaps the car when viewed from the top thereof. Therefore, even when the size of the traction machine needs to be increased, there is no need to modify the size of the gap between the car 7 and the wall of the hoistway, thereby making it possible to reduce the space for the hoistway.

[0036] Additionally, the traction machine is disposed so that the traction sheave faces the wall of the hoistway, the traction sheave being located within a gap between the wall of the hoistway and the car. Therefore, the cross-sectional area of the hoistway can be reduced.

[0037] Furthermore, the traction machine includes the traction sheave and the motor portion for rotating the traction sheave, the motor portion being located so as to partially or totally overlap the car when viewed from the top thereof. Therefore, even when the size of the motor portion needs to be increased, there is no need to modify the size of the gap between the car 7 and the wall of the hoistway, thereby making it possible to reduce the space for the hoistway.

[0038] Moreover, the elevator apparatus has the machine base that is fixed to the top portions of the car guide rails, and the traction machine is fixed onto the machine base. Therefore, the positional relationship between the traction sheave and the car can be main-

tained.

[0039] Additionally, the elevator apparatus has the machine base to which the traction machine is fixed and the first supporting member disposed between the machine base and the traction machine for elastically supporting the vertical load of the traction machine. Therefore vertical vibrations can be prevented.

[0040] Furthermore, there are provided the machine base to which the traction machine is fixed and the brace mounted on the machine base for preventing the rolling of the traction machine. Therefore rolling of the traction machine can be prevented, whereby stable driving can be attained.

[0041] Moreover, the elevator apparatus has the second supporting member disposed between the brace and the traction machine for elastically supporting a horizontal load of the traction machine. Therefore the horizontal vibrations can be prevented.

INDUSTRIAL APPLICABILITY

[0042] Thus, the elevator apparatus according to the present invention is a machine room-less type elevator apparatus in which a traction machine is disposed at a top portion of a hoistway and can be applied to an elevator apparatus in which the effective utilization of the cross-sectional space of the hoistway is required.

Claims

1. An elevator apparatus comprising:

   a car adapted to ascend/descend within a hoistway;
   car guide rails for guiding the ascent/descent of said car;
   a counterweight adapted to ascend/descend within said hoistway in a direction opposite that in which said car descends/ascends;
   counterweight guide rails for guiding the ascent/descent of said counterweight; and
   a traction machine disposed at a top portion within said hoistway, having a traction sheave around which a rope is wound and adapted to raise/lower said car and said counterweight via said rope by rotating said traction sheave,

   characterized in that
   said traction machine is disposed above a hoist passage for said car and said traction machine partially overlaps said car when viewed from the top thereof.

2. An elevator apparatus as defined in claim 1, **characterized in that** said traction machine is disposed so that said traction sheave faces a wall of said hoistway, said traction sheave being located within a gap between the wall of said hoistway and said car.

3. An elevator apparatus as defined in claim 2, **characterized in that** said traction machine comprises said traction sheave and a motor portion for rotating said traction sheave, said motor portion being located so as to partially or totally overlap said car when viewed from the top thereof.

4. An elevator apparatus as defined in claim 1, **characterized by** further comprising a machine base which is fixed to top portions of said car guide rails, wherein said traction machine is fixed onto said machine base.

5. An elevator apparatus as defined in claim 1, **characterized by** further comprising: a machine base to which said traction machine is fixed; and a first supporting member disposed between said machine base and said traction machine for elastically supporting a vertical load of said traction machine.

6. An elevator apparatus as defined in claim 5, **characterized in that** a machine base to which said traction machine is fixed and a brace mounted on said machine base for preventing the rolling of said traction machine are provided.

7. An elevator apparatus as defined in claim 6, **characterized by** further comprising: a second supporting member disposed between said brace and said traction machine for elastically supporting a horizontal load of said traction machine.

FIG. 1

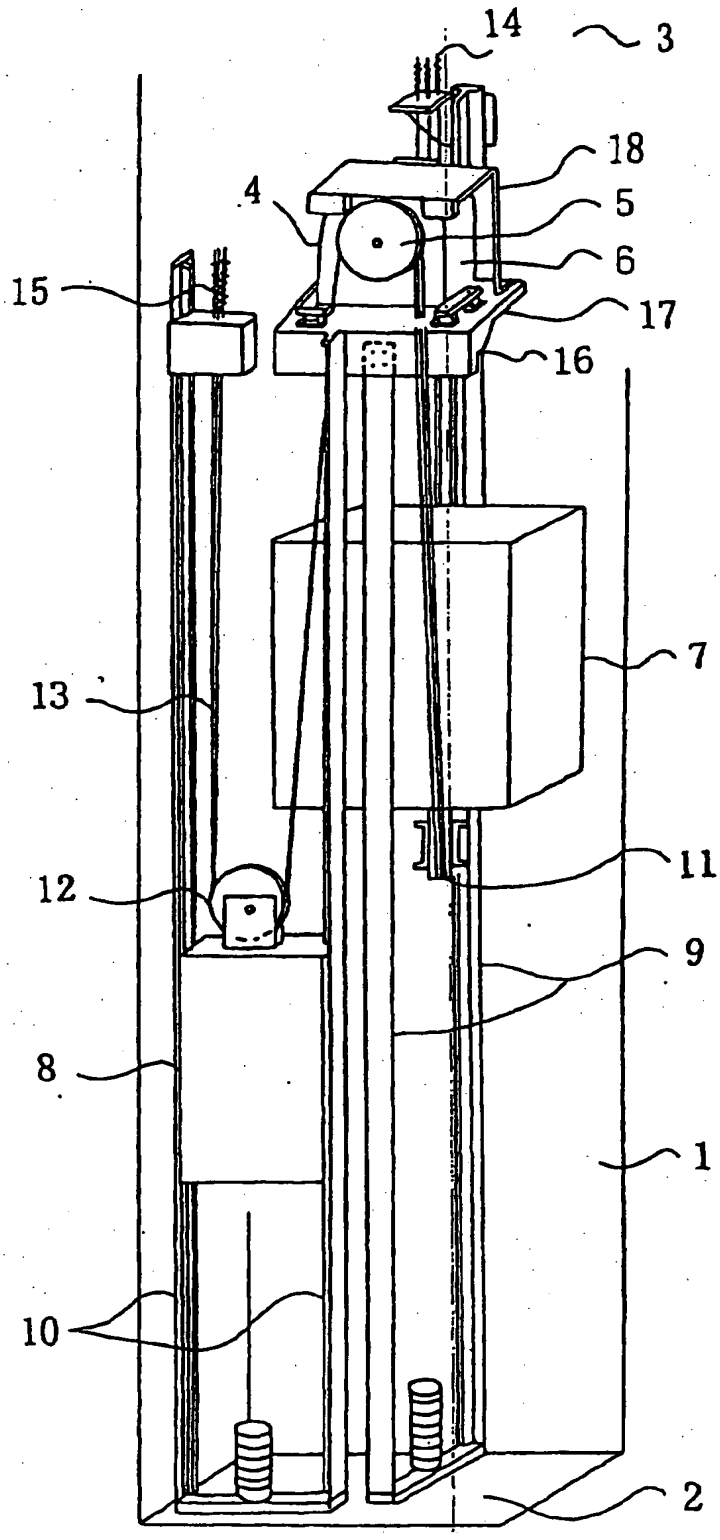


FIG. 2

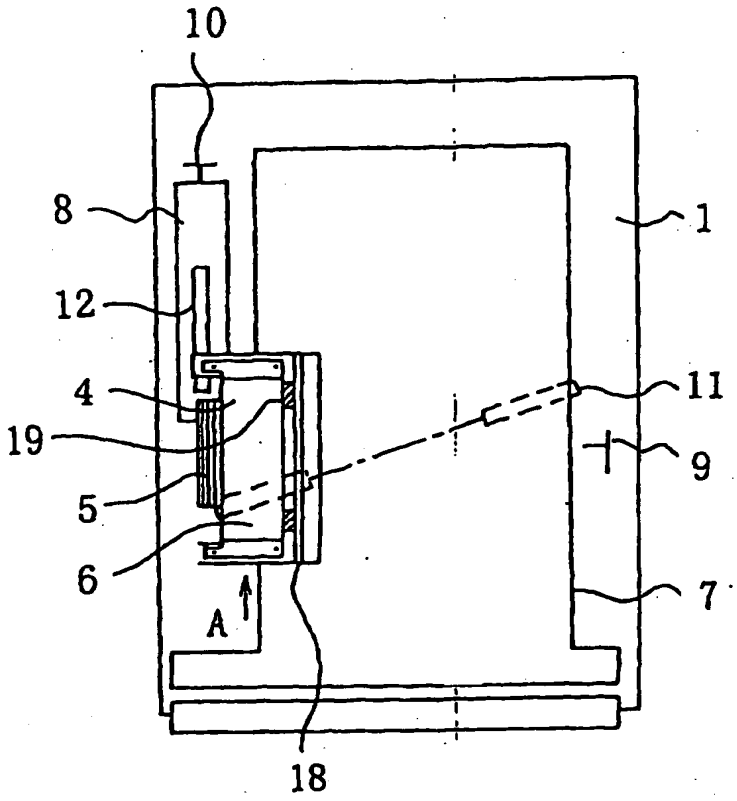


FIG. 3

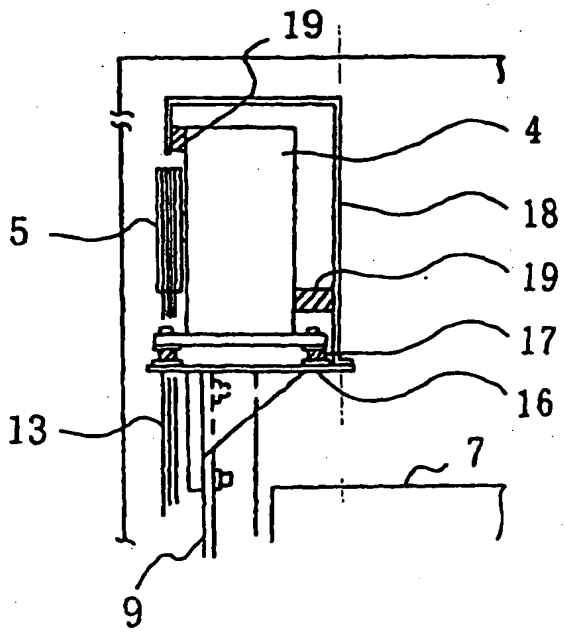


FIG. 4

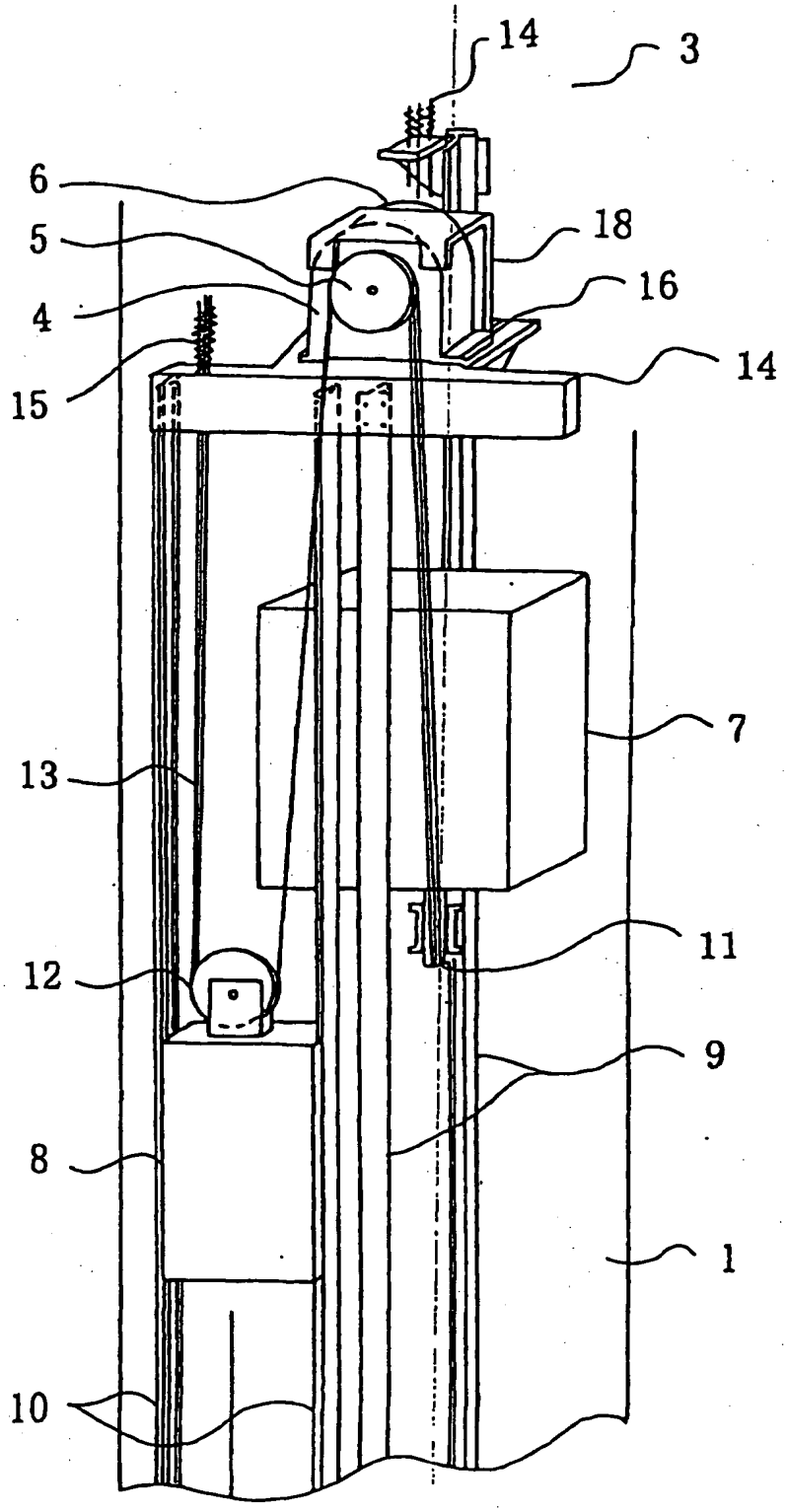


FIG. 5

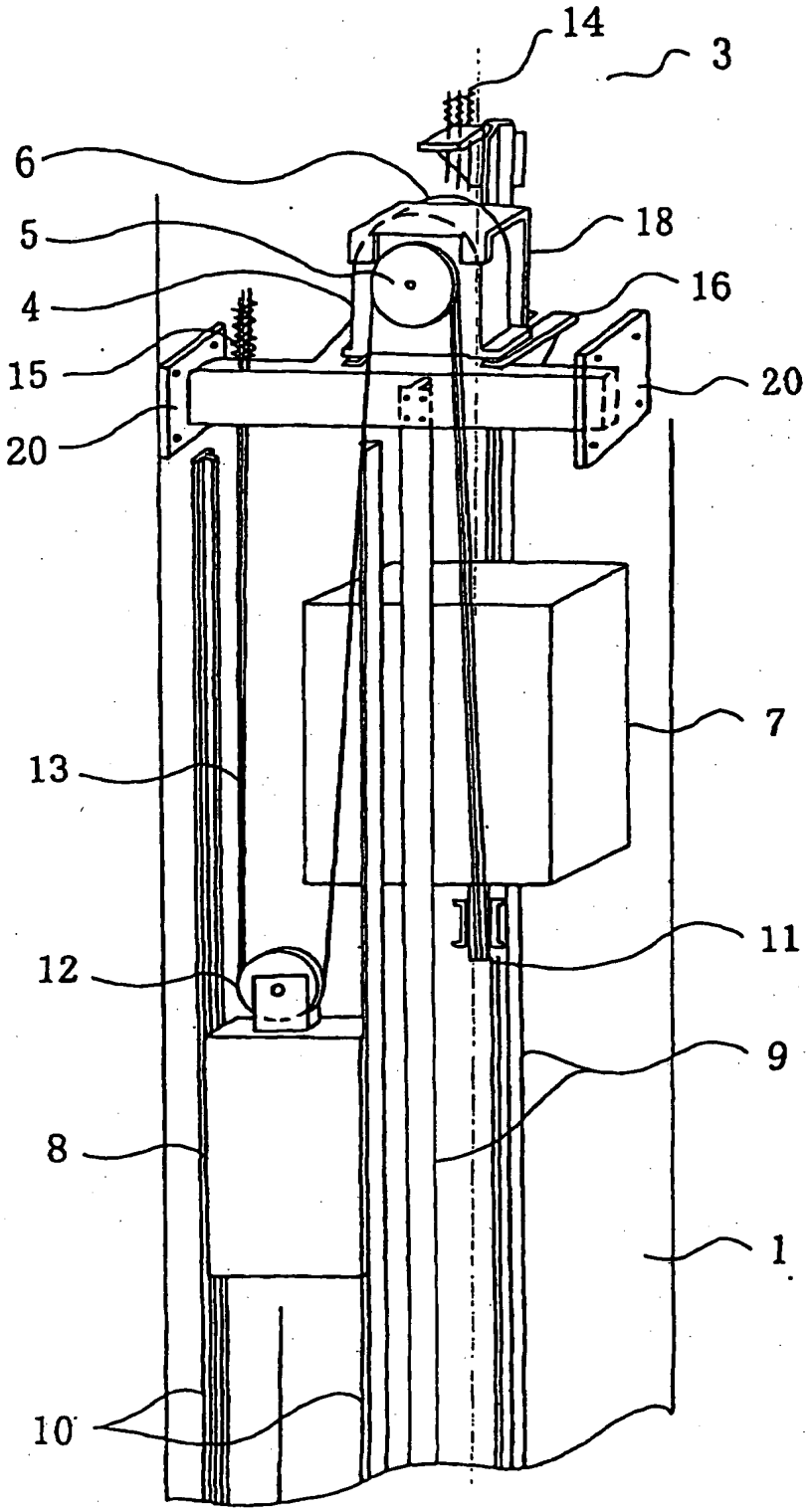


FIG. 6

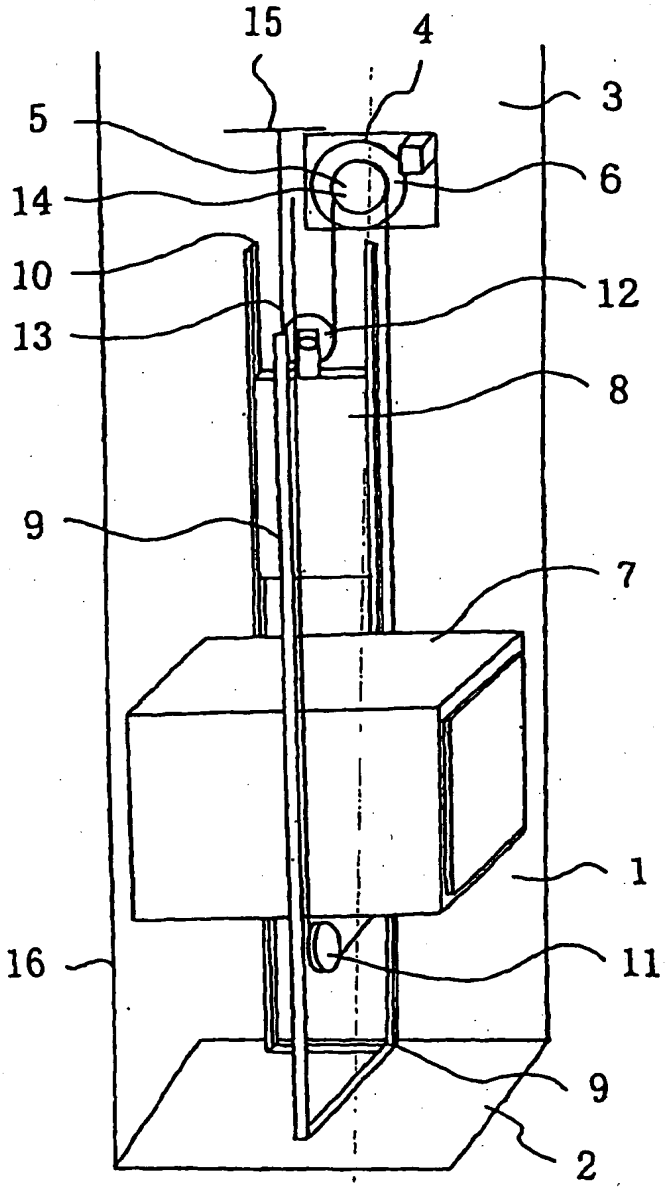
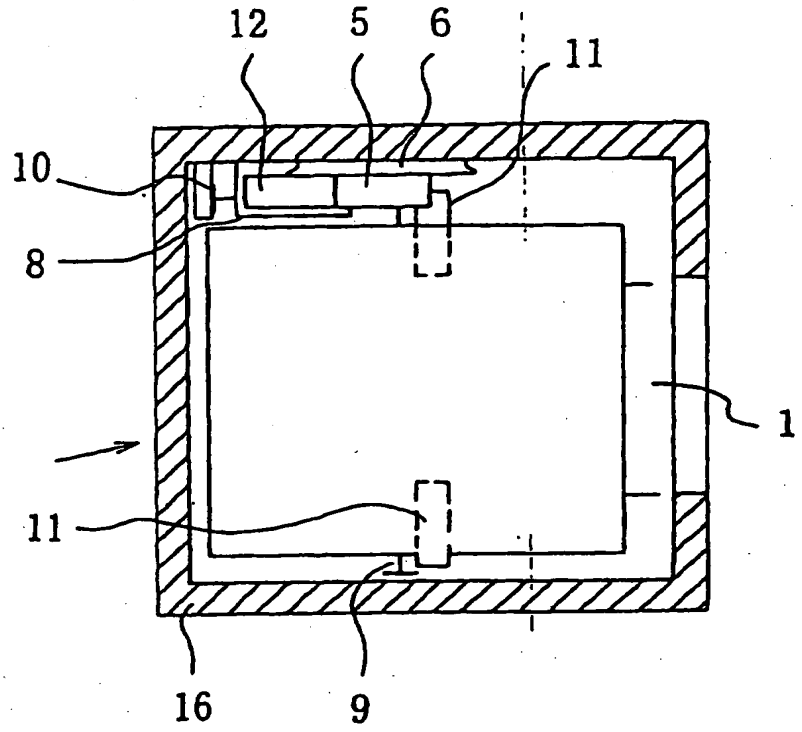


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP00/03408

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B 7/00, 11/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] B66B 7/00-11/08

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2000
Kokai Jitsuyo Shinan Koho 1971-2000 Toroku Jitsuyo Shinan Koho 1994-2000

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP, 0905081, A2 (Kabushiki Kaisha Toshiba), 31 March, 1999 (31.03.99), & CN, 1212948, A	1-7
X	JP, 11-139730, A (Toshiba Corporation), 25 May, 1999 (25.05.99), (Family: none)	1-7
X	JP, 1-267286, A (Hitachi Ltd.), 25 October, 1989 (25.10.89), (Family: none)	1
A	JP, 8-208152, A (Kone Oy), 18 August, 1996 (18.08.96), & EP, 0710618, A2 & FI, 96198, B	1

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
12 September, 2000 (12.09.00)	19 September, 2000 (19.09.00)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)